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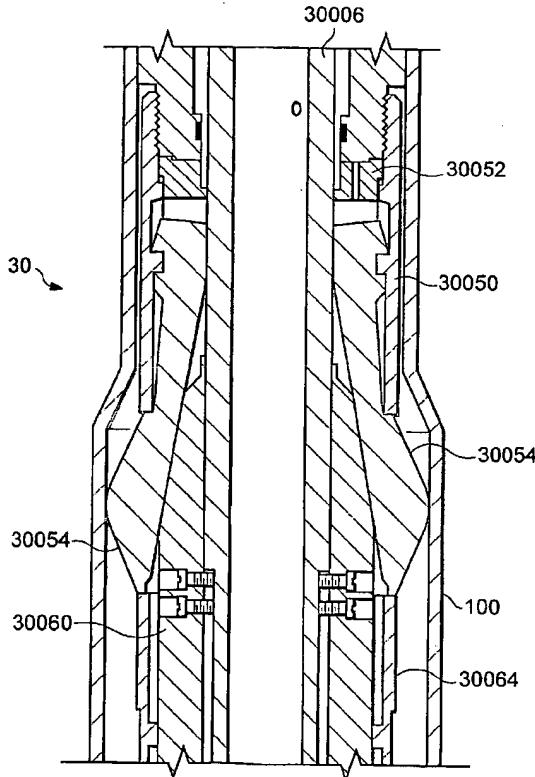
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[Continued on next page]

(54) Title: APPARATUS FOR RADIALLY EXPANDING AND PLASTICALLY DEFORMING A TUBULAR MEMBER

(57) Abstract: An apparatus for radially expanding and plastically deforming a tubular member.



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**Declaration under Rule 4.17:**

- *of inventorship (Rule 4.17(iv))*

**Published:**

- *with international search report*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

**(88) Date of publication of the international search report:**

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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/10317

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC: E21B 23/01( 2006.01),29/08( 2006.01)

USPC: 166/55.7,118,207,298,382,384

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 166/55.7,118,207,298,382,384

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
Please See Continuation Sheet

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category * | Citation of document, with indication, where appropriate, of the relevant passages                       | Relevant to claim No. |
|------------|--|-----------------------|
| X          | US 6,076,601 A (MOONEY, JR.) 20 June 2000 (20.06.2000), see entire document, especially the figures.     | 284, 469-478          |
| X          | US 5,735,359 A (LEE et al.) 07 April 1998 (07.04.1998), see entire document, especially Figs. 1-2.       | 284, 469-478          |
| X          | US 4,889,197 A (BOE) 26 December 1989 (26.12.1989), see entire document, especially Figs. 1-2.           | 284, 469-478          |
| X          | US 6,464,003 B2 (BLOOM et al.) 15 October 2002 (15.10.2002), see entire document, especially Fig. 2.     | 298, 304-306, 479-481 |
| X          | US 5,887,654 A (EDWARDS et al.) 30 March 1999 (30.03.1999), see entire document, especially the figures. | 298, 304-306, 479-481 |
| X          | US 6,457,966 B1 (SAVIOLI) 01 October 2002 (01.10.2002), see entire document, especially the figures.     | 338-389               |
| X          | US 4,080,140 A (WILSON et al.) 21 March 1978 (21.03.1978), see entire document, especially the figures.  | 338-389               |

Further documents are listed in the continuation of Box C.

See patent family annex.

|     |   |     |  |
|-----|---|-----|--|
| *   | Special categories of cited documents:  | "T" | later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention  |
| "A" | document defining the general state of the art which is not considered to be of particular relevance  | "X" | document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step  |
| "E" | earlier application or patent published on or after the international filing date   | "Y" | document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is taken alone   |
| "L" | document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) | "&" | document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art |
| "O" | document referring to an oral disclosure, use, exhibition or other means  |     | document member of the same patent family  |
| "P" | document published prior to the international filing date but later than the priority date claimed  |     |  |

Date of the actual completion of the international search

17 May 2006 (17.05.2006)

Date of mailing of the international search report

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Name and mailing address of the ISA/US

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**INTERNATIONAL SEARCH REPORT**International application No.  
PCT/US04/10317**C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category * | Citation of document, with indication, where appropriate, of the relevant passages                   | Relevant to claim No. |
|------------|--|-----------------------|
| A          | US 6,607,220 B2 (SIVLEY, IV) 19 August 2003 (19.08.2003), see entire document, especially Figs. 1-4. | 338-389               |

**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/US04/10317

**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:  
Please See Continuation Sheet

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2.  As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of any additional fees.
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

No protest accompanied the payment of additional search fees.

**INTERNATIONAL SEARCH REPORT**

International application No.  
PCT/US04/10317

**BOX III. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING**

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s) 284 and 469-478, drawn to an apparatus and method for cutting a tubular.

Group II, claim(s) 298, 304-306, and 479-481, drawn to an apparatus and method for gripping a tubular.

Group III, claim(s) 338-389, drawn to a method of expanding and deforming a tubular.

The inventions listed as Groups I do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of group I involves engaging a plurality of cutting elements with a tubular member; the special technical feature of group II involves engaging gripping elements within a tubular member; and the special technical feature of group III involves radial expansion of a tubular member by an expansion device.

**Continuation of B. FIELDS SEARCHED Item 3:**

East: ((radial\$2 with expan\$5) and (plastic\$4 with deform\$6)) with (tub\$5 pip\$3 conduit\$1 casing\$1 liner\$1),  
(grip\$4 with (tub\$5 pip\$3 conduit\$1 casing\$1 liner\$1)) and ((within inside interior inner) with engag\$5 with (grip\$4 grab\$4)) and (bias\$3 and (axial\$2 longitudinal\$2)) with (grip\$4 grab\$4),  
(cut\$4 with (tub\$5 pip\$3 conduit\$1 casing\$1 liner\$1)) and (support\$3 with (coupl\$3 attach\$3 connect\$3) with cutt\$3 with (mov\$4 motion))